



299-E28-25 (A6801)

Log Data Report

Borehole Information:

Borehole: 299-E28-25 (A6801)		Site: 216-B-5 Injection Well			
Coordinates		GWL (ft)¹: 287.68	GWL Date: ~10/10/01		
North 136737	East 573777	Drill Date Feb. 1980	TOC² Elevation N/A ³	Total Depth (ft) 331	Type Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	1.42	8 5/8	8.0	.312	0	~263
Steel Welded	1.32"	4.25	3.75	0.25	1.25"	327

Borehole Notes:

The logging engineer measured the pipe stickup at the borehole using a steel tape. Casing thickness was difficult to obtain due to casing configuration. The outside diameter of the 4-in. casing was obtained using a tape measure. The casing inside diameter is calculated.

The casing configuration information is from the well construction and completion summary included in Ledgerwood (1992). The 9-in. nominal casing extends from the ground surface to about 263 ft while the 4-in. nominal casing extends to 327 ft. The 9-in. nominal casing was grouted from 0 to 20 ft, and the temporary 10-in. surface casing was pulled before a 2-ft cement pad was poured. Six-inch protective casing was run to allow screen installation. The screen was placed, and the 6-in. casing was removed while placing gravel pack. A 4-in. screen is present from 279 to 329 ft with a gravel pack from 270 to 328 ft. During drilling, the first detected contamination was ~600 to 800 counts per minute (cpm) beta-gamma at 254 ft.

Logging Equipment Information:

Logging System: Gamma 1D	Type: SGLS (35%)
Calibration Date: 07/01	Calibration Reference: GJO-2001-243-TAR
	Logging Procedure: MAC-HGLP 1.6.5

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	5	6
Date	10/22/01	10/23/01	10/24/01	10/25/01	10/29/01	
Logging Engineer	Musial	Musial	Musial	Musial	Musial	
Start Depth (ft)	287.5	233.0	152.0	1.5	16.0	
Finish Depth (ft)	234.0	151.0	89.0	17.0	90.0	
Count Time (sec)	100	100	100	100	100	
Live/Real	R	R	R	R	R	
Shield (Y/N)	n/a ⁴	n/a	n/a	n/a	n/a	
MSA Interval (ft)	0.5	0.5	0.5	0.5	0.5	
ft/min	n/a	n/a	n/a	n/a	n/a	

Log Run	1	2	3	4	5	6
Pre-Verification	A0023CAB	A0024CAB	A0025CAB	A0026CAB	A0027CAB	
Start File	A0023000	A0024000	A0025000	A0026000	A0027000	
Finish File	A0023107	A0024162	A0025126	A0026032	A0027148	
Post-Verification	A0023CAA	A0024CAA	A0025CAA	A0026CAA	A0027CAA	
Depth Return Error (in.)	0	-1	0	0	-0.5	
Comments	No fine gain adjustments.	No fine gain adjustments.	Fine gain adjustment made on file A0025058.	No fine gain adjustments.	No fine gain adjustments.	

Logging Operation Notes:

Zero reference is the top of casing. No centralizer was used due to the small diameter of the borehole.

Analysis Notes:

Analyst:	Sobczyk	Date:	11/13/01	Reference:	MAC-VZCP 1.7.9 Rev. 2
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Pre-run and post-run verification spectra for the SGLS were evaluated. The acceptance criteria for field verification of the Gamma 1D logging system are in the process of being established. The photopeak counts per second for the 2614.5-keV, 1461-keV, and 609-keV peaks were slightly lower in the post-run verification spectra when compared to the pre-run verification spectra. Examinations of spectra indicate that the detector appears to have functioned normally during the log runs, and the log data are provisionally accepted, subject to further review and analysis.

Individual spectra were processed in batch mode using APTEC Supervisor. Activities were calculated in EXCEL, using parameters determined from analysis of calibration data collected in June 2001. The casing configuration was assumed to be a string of 8-in. casing with a thickness of 0.312 in. to a subsurface depth of 268.5 ft (TOC is the zero reference). The As-Built for this borehole shows the 8-in. casing as extending to an approximate depth of 263 ft (Ledgerwood 1992). When a casing depth of 263 ft was used, the log values appeared to be under corrected within the interval from 263 to 268.5 ft, and the driller's log does not indicate a change in lithology in this interval. A casing thickness of 0.25 in. was used for the 4-in. casing from the ground surface to 288 ft. The inner casing was screened from 279 to 329 ft (Ledgerwood 1992), and the gamma-ray attenuation through the casing screen appears to be less than in the solid casing above 279 ft. The casing thickness assumptions are consistent with the measurements acquired by the logging engineer. A correction for water in the borehole and dead time corrections were not needed.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and ^{137}Cs . For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Zero reference is the top of the casing. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation.

Results and Interpretations:

^{137}Cs , which is a man-made radionuclide, was detected in this borehole. A zone of ^{137}Cs contamination was detected near the ground surface (log depth 2.0 through 16.5 ft) with activities ranging from 0.6 to 2.6 pCi/g. ^{137}Cs was intermittently detected near the MDL at 25.0, 41.5, 49.0, 54.0, 54.5, 179.5, 210.5, and

246.0 ft. The interval from 252.5 to 287.5 ft contained the highest activities of ¹³⁷Cs. The highest activity detected was 398 pCi/g at 254.5 ft versus 360 pCi/g in 1991 (Brodeur 1993) with the RLS detector. On the basis of sample data, Smith (1980) reported maximum concentrations of about 190 pCi/g of ¹³⁷Cs, 80 pCi/g of ⁹⁰Sr, 87 pCi/g of ²³⁹⁻²⁴⁰Pu, and 0.17 pCi/g of ²⁴¹Am between 288 and 327 ft. Waste management issues restrict logging in the groundwater.

The usefulness of the SGLS data for lithologic correlations is reduced because of the well completion. This borehole has two strings of casing from the ground surface to at least 263 ft, a gravel pack from 270 to 328 ft, and a 4-in. screen from 279 to 329 ft (Ledgerwood 1992). Furthermore, the top 20 ft of the borehole has been grouted outside of the 8-in. casing (Ledgerwood 1992).

Alkaline, low-salt, radioactive liquid wastes from B Plant were discharged to groundwater between 1945 and 1947 (Smith 1980) in the 216-B-5 Reverse Well, which is located about 70 ft east of 299-E28-25. During this period, about 31 million liters of liquid waste containing 80.7 Curies of ¹³⁷Cs were discharged (Brown and Rupert 1950). Because of waste management issues, MACTEC-ERS is unable to log beneath the water table in this well and all other wells in the 200 Areas. In addition, due to waste management issues, most of the wells near the 216-B-5 injection wells were not sampled for the groundwater program during fiscal year 2000 (PNNL 2001).

The SGLS should be used to log the interval in the groundwater (288.0 to 327 ft) in this well and in nearby wells. Logging in the groundwater is essential in fully characterizing the area surrounding the 216-B-5 Reverse Well, which is a representative site for the 200-TW-2 Tank Waste Group Operable Unit (DOE 2000). Both Brown and Rupert (1950) and Smith (1980) constructed detailed maps and geologic cross-sections showing the distribution of gamma-emitting radionuclides in the aquifer. Logging beneath the water table in the vicinity of the 216-B-5 Reverse Well will supply data that are fundamental to determining mobility of ¹³⁷Cs in groundwater under field conditions and for direct comparison to data collected over the past fifty years (Brown and Rupert 1950; Smith 1980).

¹ GWL – groundwater level

² TOC – top of casing

³ N/A – not available

⁴ n/a – not applicable

References:

Brodeur, J.R., 1993. *Results of Spectral Gamma-Ray Logging of Select Boreholes for the Aggregate Area Management Study*, WHC-SD-EN-TI-021, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Brown, R.E., and H.G. Ruppert, 1950. *The Underground Disposal of Liquid Wastes at the Hanford Works*, Washington, HW-17088, General Electric Hanford Company, Richland, Washington.

Ledgerwood, R.K., 1992. *Summaries of Well Construction Data and Field Observations for Existing 200-East Aggregate Area Operable Unit Resource Protection Wells*, Draft WHC-SD-ER-T12EAA, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

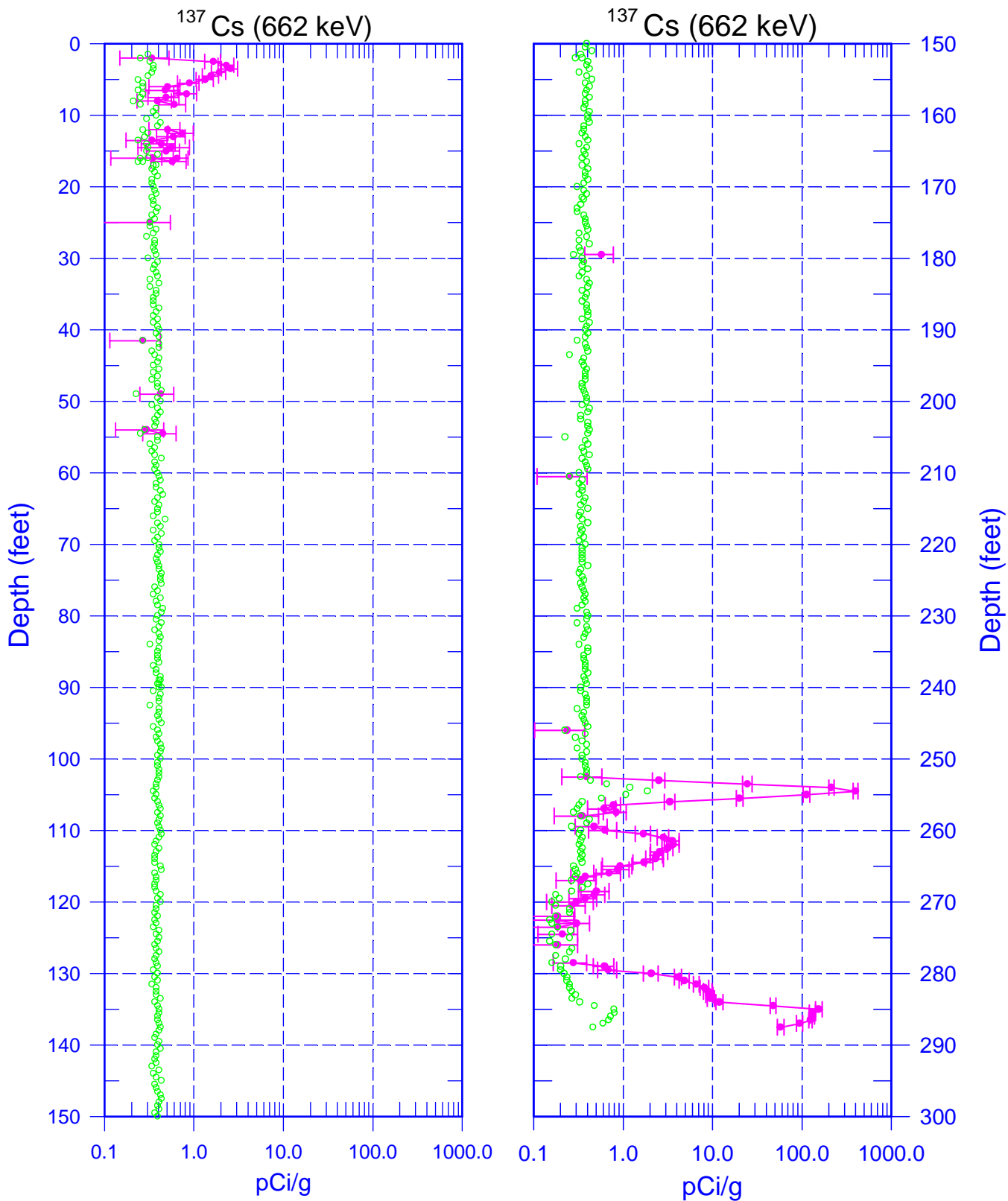
Pacific Northwest National Laboratories (PNNL), 2000. *Hanford Site Groundwater Monitoring for Fiscal Year 2000*, PNNL-13404, Pacific Northwest National Laboratory, Richland, Washington.

Smith, R.M., 1980. *216-B-5 Reverse Well Characterization Study*, RHO-ST-37, Rockwell Hanford Operations, Richland, Washington.

U.S. Department of Energy (DOE), 2000. *200-TW-1 Scavenged Waste Group Operable Unit and 200-TW-2 Tank Waste Group Operable Unit RI/FS Work Plan*, DOE/RL-2000-38, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

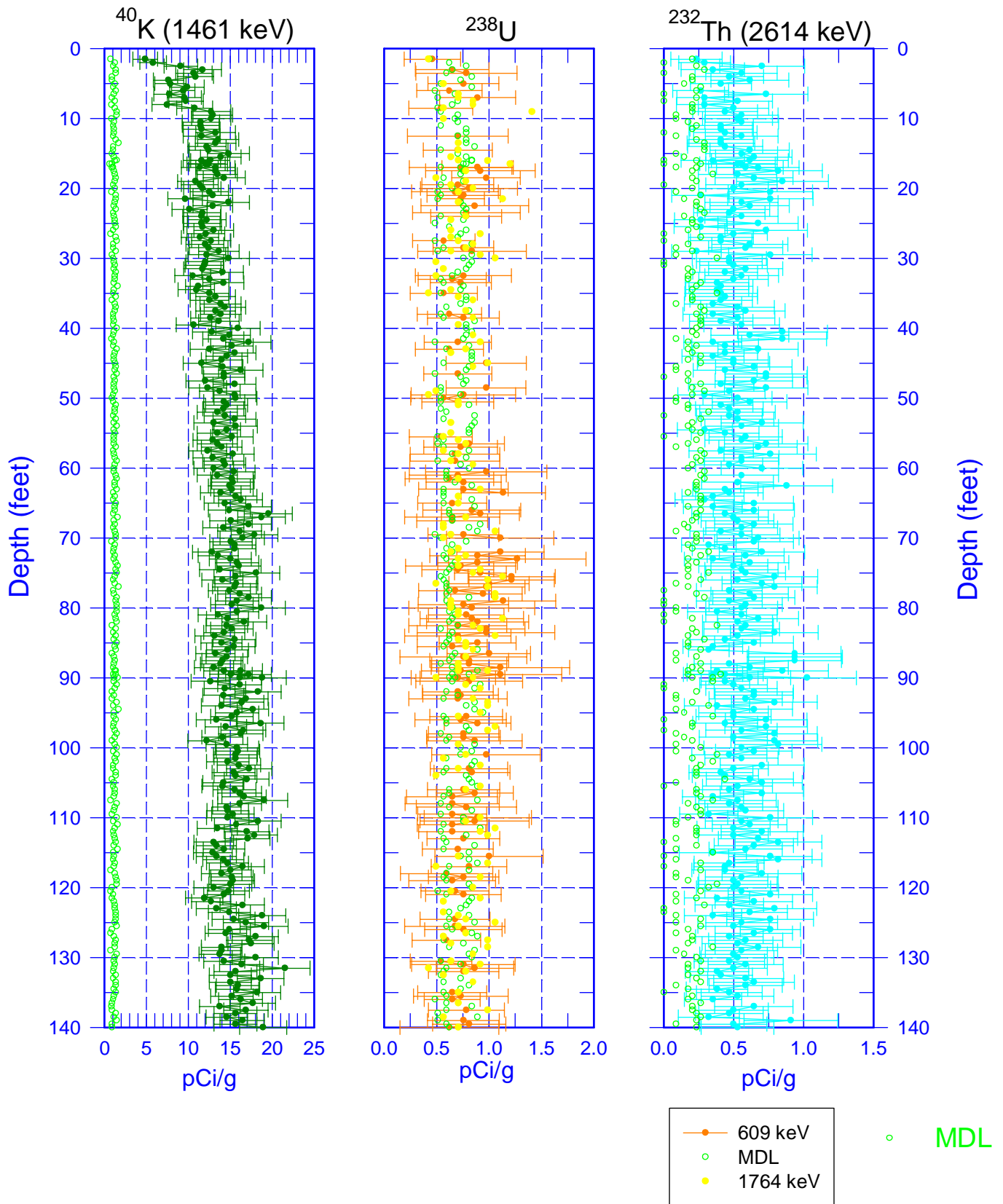
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Man-Made Radionuclide Concentrations



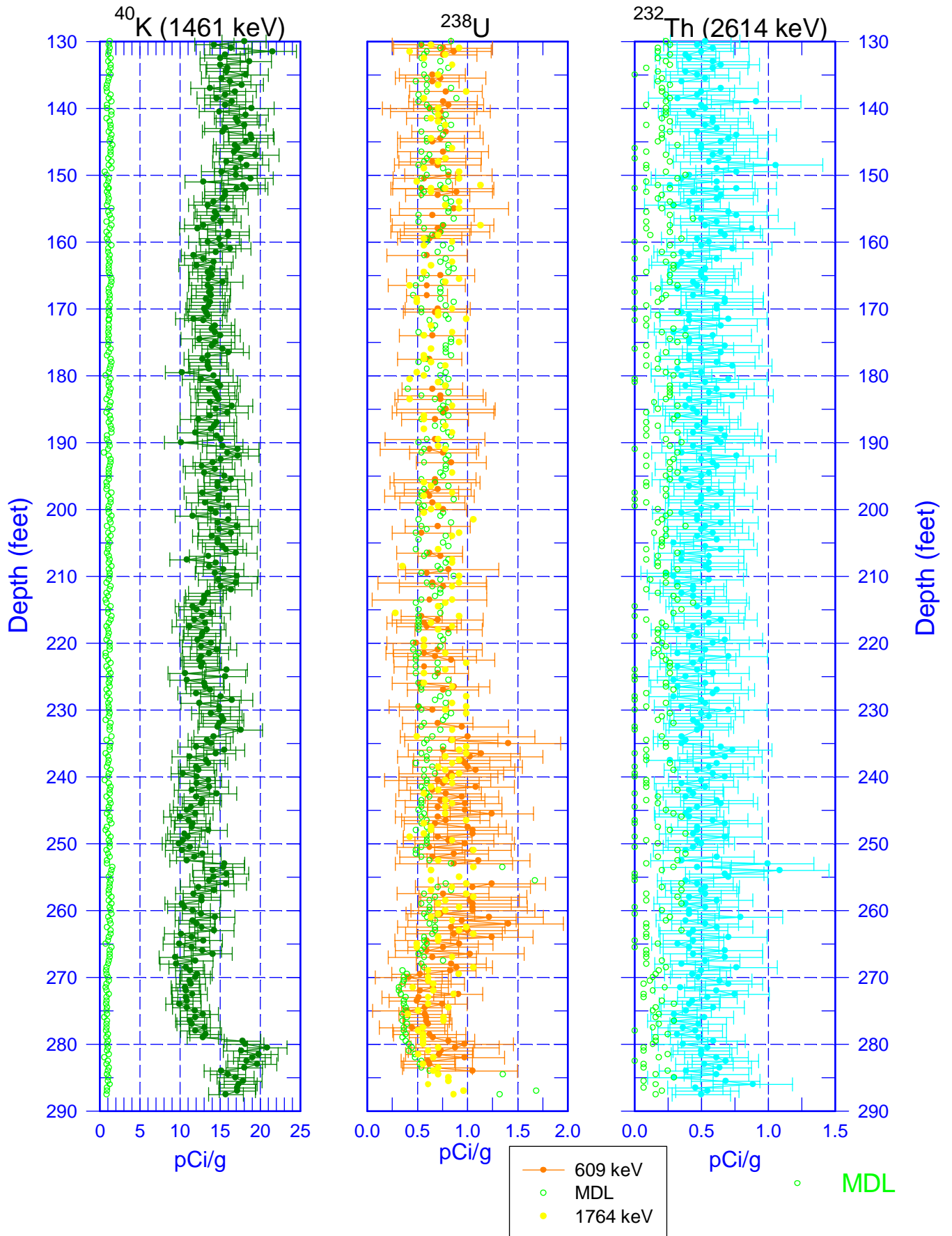
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Natural Gamma Logs

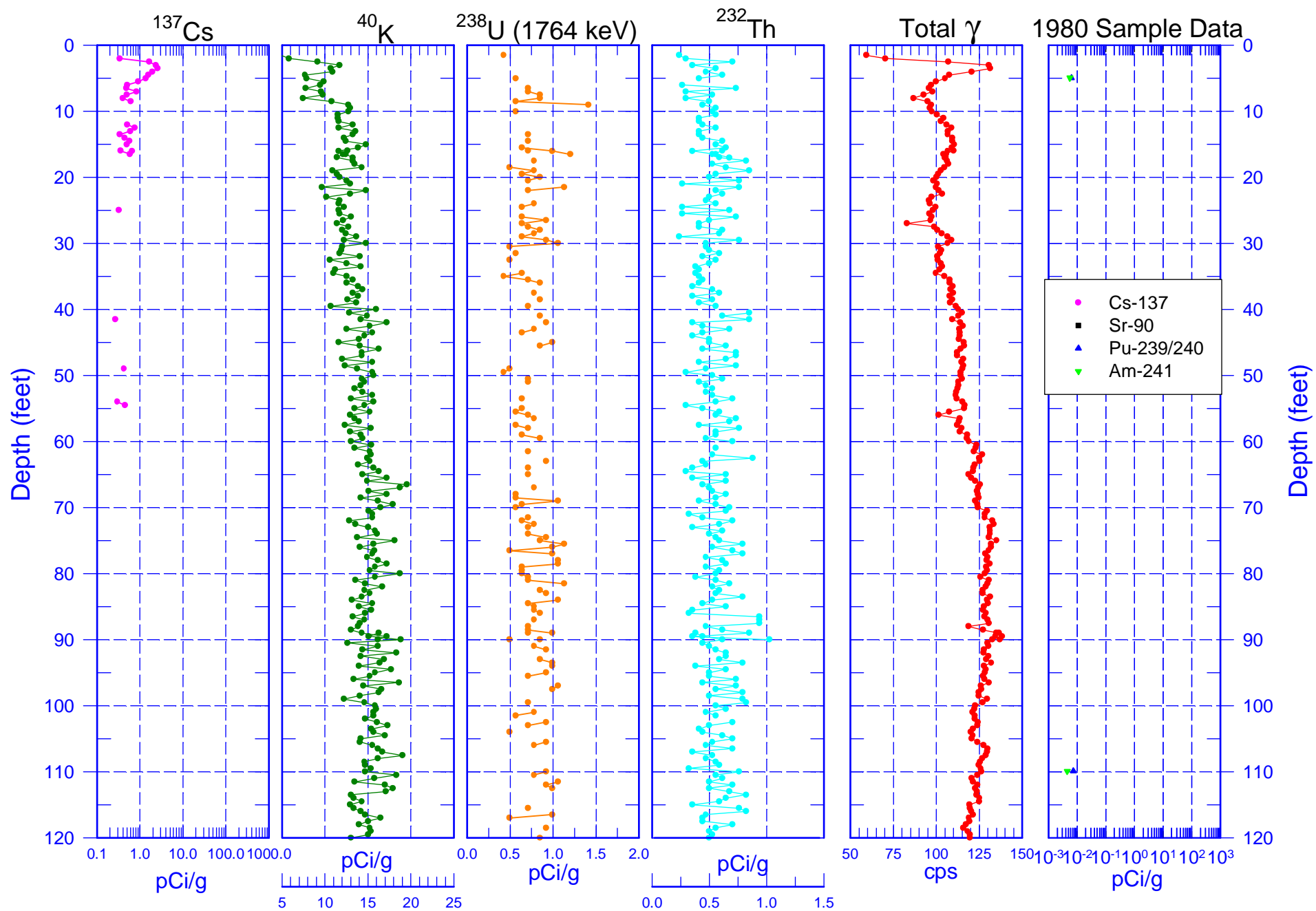


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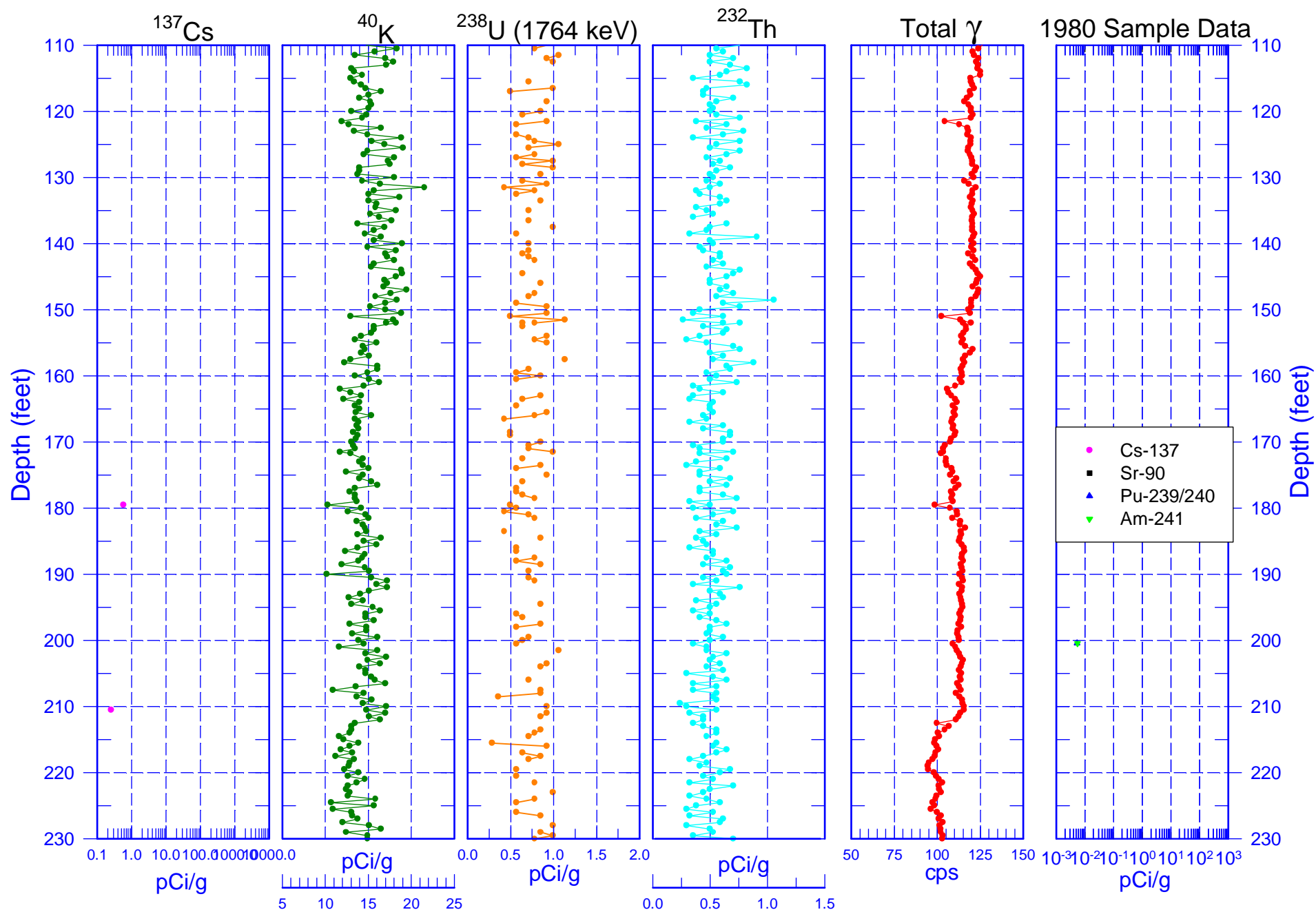
Natural Gamma Logs



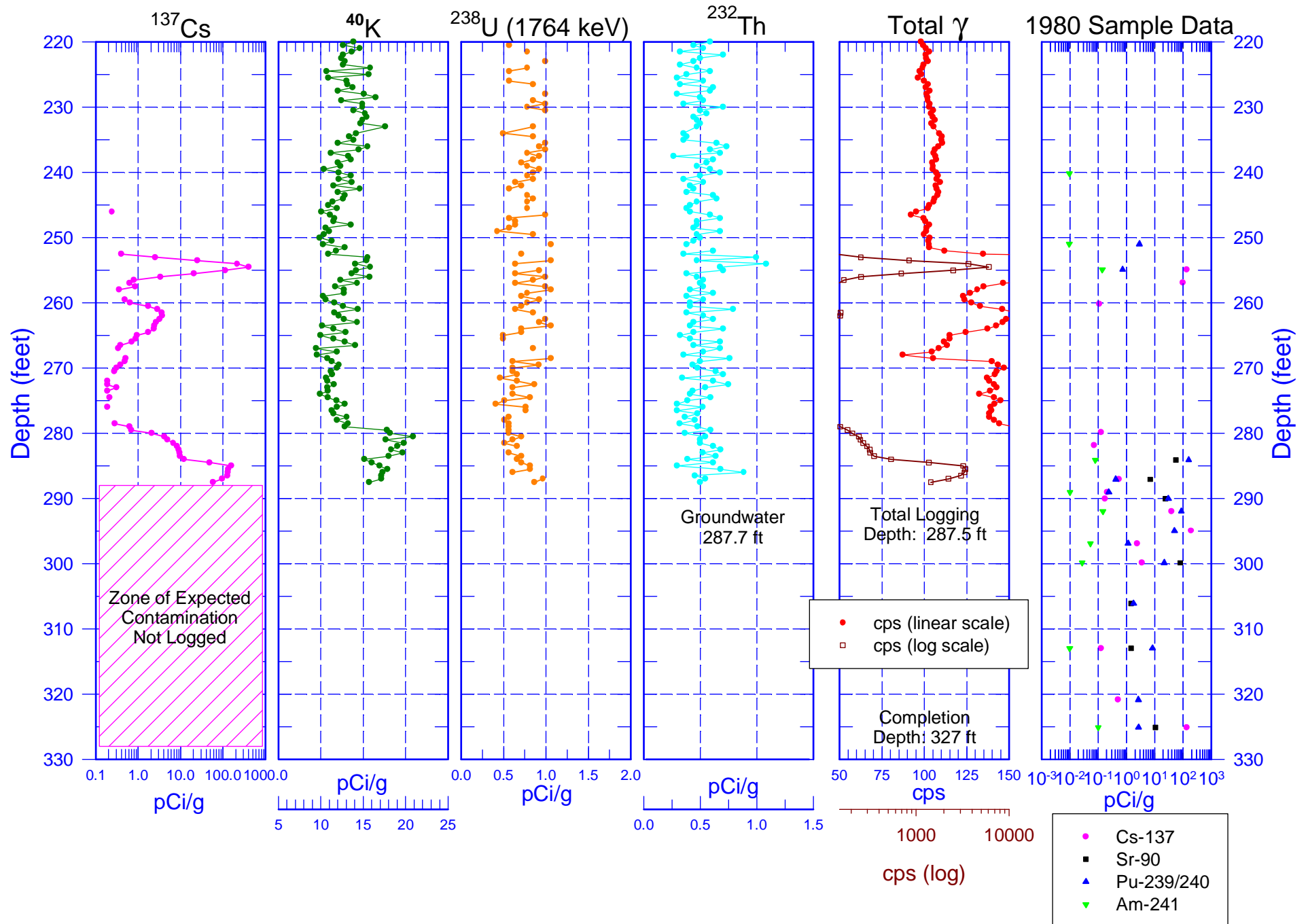
299-E28-25 (A6801) Combination Plot



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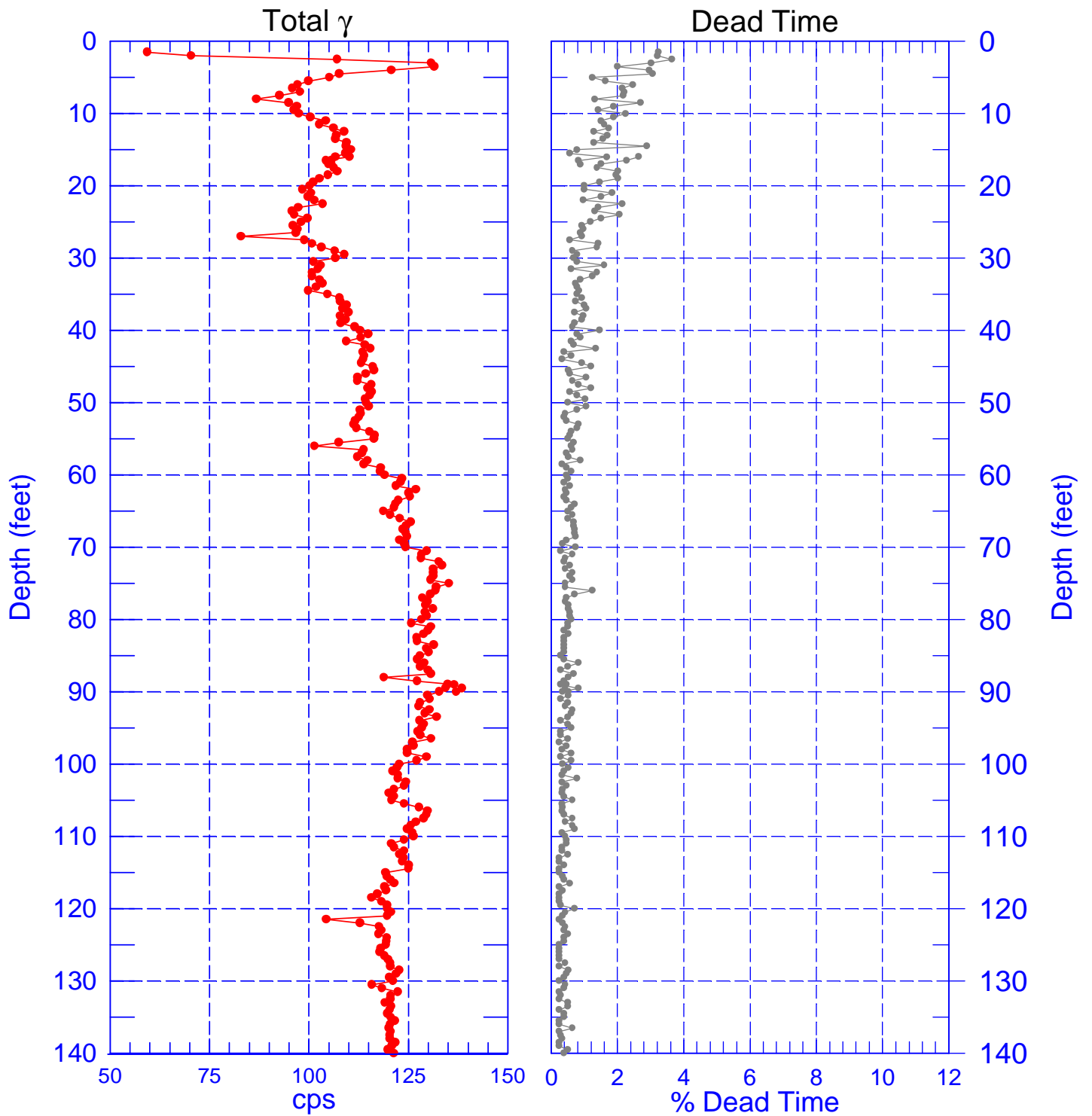


299-E28-25 (A6801) Combination Plot



299-E28-25 (A6801)

Total Gamma & Dead Time



299-E28-25 (A6801)

Total Gamma & Dead Time

